A REVISION OF THE BRITISH EOCENE *SCAPHOPODA*, WITH DESCRIPTIONS OF SOME NEW SPECIES.

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PLATE VI. Fig. 1.

The British Eocene Scaphopods, although they have in part been treated of in various works devoted to tertiary palæontology, have never been brought together as a whole, and the literature of the subject is so scattered that we thought some such conspectus as here essayed would be useful. Moreover, the correct determination of many of the species has for years rested on too theoretical a basis, the types for the most part not being of English origin. The splendid collection of English and Paris Basin tertiary mollusca in the Natural History Museum, however, with the type specimens of some of Sowerby's species, have enabled us to clear up these difficulties, and we are also in a position to describe some new species.

The classification adopted is based on that of Stoliczka, who paid special attention to this class, but we have not been unmindful of recent progress in the subject on the Continent.

Family DENTALIIDÆ.

Genus DENTALIUM, Linnæus.

Systema Naturæ, 1767, Ed. 12, Vol. i. Part 2, p. 1263.

Type.—Dentalium elephantinum, Linnæus (reference as above).

Posterior orifice truncated; not fissured; surface ornamented with longitudinal ribs.

Dentalium nitens, J. Sowerby.

Dentalium nitens, J. Sowerby.—Mineral Conchology, 1814, vol. i. p. 159, pl. lxx. figs. 1, 2.

Dentalium, sp. G. B. Sowerby.—Quart. Journ. Geol. Soc. 1859, vol. xv. p. 136, pl. v. fig. 5.

Fustiaria nitens, R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 285.

Shell "nearly straight; surface even and shining; aperture circular; mouth expanded."—*J. Sowerby*. This is one of the rare Eocene forms without any evidence of a fissure, hence we regard it as a Dentalium; it is, however, a perfectly smooth shell, and in that respect differs from the type of the genus. Common. Type in the Natural History Museum.

Formations and Localities.—London Clay: Finchley, Haverstock

Hill, Highgate Archway and Potter's Bar. Oldhaven Beds (?) : Chislet. Thanet Sands : Pegwell Bay.

Dentalium constrictum, n.sp.

Shell slightly curved posteriorly, almost straight in its anterior portion; section circular; surface ornamented with closely set concentric striæ, constricted at irregular intervals, producing a rugose appearance; longitudinal striæ when present very obsolete; fissure absent. Length 16; diam. 2 mm.

Dentalium constrictum, n.sp.

This species bears a close resemblance to *Entaliopsis annulata* so far as the concentric ornamentation is concerned; that character, however, is much less pronounced, being in fact almost obsolete in some specimens. The irregularly disposed constrictions, with the absence of a fissure, are sufficiently distinctive. It differs from *D. nitens*, which is a smooth species deficient in constrictions. The specimen figured, which is in the Natural History Museum, is of average dimensions, but some others not so well preserved reach a length of 21 mm. It appears to be common and confined to the Hampshire basin.

Formation. — London Clay. *Localities.* — Fareham (type) and Portsmouth.

Genus FUSTIARIA, Stoliczka.

Cretaceous Gastropoda, Mem. Geol. Surv. India, 1868, p. 439.

Type.—Dentalium eburneum, Linnæus, Systema Naturæ, 1767, ed. 12, vol. i, part 2, p. 1264.

"Shell tubular, thin, usually slightly curved, smooth, posterior end with a long linear slit, on or near the ventral side."—*Stoliczka.*

Fustiaria fissura, Lamarck.

Dentalium fissura, Lamk.— Hist. Nat. Anim. sans Vert. 1818, vol. v. p. 346. Desh.—Mém. Soc. Hist. Nat. Paris, 1826, vol. ii. part 2, p. 368, pl. xviii. figs. 6, 7.

Dentalium nitens, J. de C. Sby.—Dixon's "Sussex," 1850, p. 95, pl. vii. fig. 3 (*non* J. Sowerby, 1814).

Dentalium fissura, Desh.—Desc. Anim. sans Vert. 1861, vol. ii. p. 213, pl. i, figs. 24, 25, 26.

Dentalium (*Fustiaria*) *fissura*, Cossm.—Ann. Soc. R. Mal. Belgique, 1888, vol. xxiii. p. 10.

Fustiaria fissura, R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 285

Distinguished from *F. lucida* by being more arch-shaped, and by having the posterior fissure much shorter; the anterior portion is relatively of larger diameter. It is rather common.

Formation —Bracklesham Beds. *Localities.*—Bracklesham Bay, Bramshaw and Brook.

Fustiaria lucida, Deshayes.

Dentalium lucidum, Desh.—Desc. Anim. sans Vert. 1861, vol. ii. p. 214, pl. i. figs. 18–20.

Dentalium (*Fustiaria*) *lucidum*, Cossm.—Ann. Soc. R. Mal. Belgique, 1888, vol. xxiii. p. 10.

Fustiaria lucida, R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 285.

This species differs from *F. fissura* in having a much longer posterior fissure, in being less arch-shaped, and narrower generally. We agree with M. Cossmann that the specimen figured by J. de C. Sowerby as *Dentalium nitens* in Dixon's "Sussex." pl. vii. fig. 3, ought properly to be referred to *F. fissura*: this conclusion we have arrived at after comparing a number of British specimens with some from the Paris basin. We may remark that *F. lucida* is confined to the Lower Eocene of the Paris basin. Very rare; one specimen only in the Museum.

Formation.—Bracklesham Beds. *Locality.*—Bracklesham Bay.

Fustiaria pellucens, Deshayes.

Dentalium pellucens, Desh.—Desc. Anim. sans Vert. 1861, vol. ii. p. 214, pl. i. figs. 21–23.

Dentalium (*Fustiaria*) *pellucens*, Cossm.—Ann. Soc. R. Mal. Belgique, 1888, vol. xxiii. p. 10.

Fustiaria pellucens, R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 286.

This is a slender form, having a greater curvature than either *F. fissura* or *F. lucida*. It is much inflated anteriorly, and very rapidly decreases in diameter towards the posterior region. The specimen from Stubbington is so fragmentary that some doubt exists as to its proper determination. Common; but perfect specimens are rather rare.

Formations and Localities.—Barton Beds: Barton and Highcliff. Bracklesham Beds: Bracklesham Bay and Stubbington.

Fustiaria subeburnea, Orbigny.

Dentalium eburneum, G. B. Sby.—Genera Rec. Foss. Shells, 1825, No. 15, fig. 6 (*non* Linnæus, *nec* Lamarck, 1818). Desh.—Mém. Soc. Hist. Nat. Paris, 1826, vol. ii. pt. 2, p. 368, pl. xvii. figs. 8–11. G. B. Sby.—Zool. Journ. 1829, vol. iv. p. 198.

Dentalium subeburneum, Orb.—Prod. Pal. Strat. 1850, vol. ii. p. 372.

Dentalium eburneum, Desh.—Desc. Anim. sans Vert. 1861, vol. ii. pp. 215, 216, pl. ii. figs. 8–13.

Dentalium (*Fustiaria*) *eburneum*, Cossm.—Ann. Soc. R. Mal. Belgique, 1888, vol xxiii. p. 10.

Fustiaria circinata, R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 284.

This species differs from *F. circinata* of the Paris basin in being shorter, its diameter is proportionately larger, and the annulations are

rather farther apart, and not so deeply sulcated. M. Deshayes, believing that Linnæus had before him a fossil from Grignon when defining his *Dentalium eburneum*, and that the latter was wrongly labelled as coming from the Indian seas, regarded the *D. eburneum* of Linnæus as identical with the Parisian shell, but from a careful examination of the recent *D. eburneum*, Linn., it is evident that M. Deshayes was mistaken, since the Indian shells agree very well with the original Linnæan description, and differ from the Calcaire Grossier specimens. M. D'Orbigny recognized this fact, and accordingly substituted the name *D. eburneum*. Very rare; only three mutilated specimens in the Museum.

Formation.—Bracklesham Beds. *Locality.*—Bracklesham Bay.

Genus ENTALIOPSIS, *nom. nov.*

Entalis, J. E. Gray.—Proc. Zool. Soc. 1847, p. 158; *non* Defrance, 1819, *nec* G. B. Sowerby, 1839.

Type.—*Dentalium entalis*, Linnæus (*em.* Forbes and Hanley), Systema Naturæ, 1767, ed. 12, vol. i. part 2, p. 1263.

There seems to be some doubt as to the type species of Gray's *Entalis*. In his description he merely says "*Dentalium e.* Desh. 1825." We have therefore followed Stoliczka in regarding *D. entalis*, Linn., as the type which is described by Linnæus—"*Testa tereti subarcuata continua lævi.*" On consulting the various authors' works cited by the last-mentioned writer, we come to the same conclusion as Forbes and Hanley, namely, that the figures referred to by Linnæus are so badly rendered that it is impossible to definitely ascertain the exact limits of this species; we have, therefore, adopted their views and restricted the species to the Swedish form. That form is practically smooth, with a short broad fissure at the posterior extremity.

We are compelled, however, to alter the name *Entalis*, since that term had already been used in another sense both by Defrance and G. B. Sowerby; and we, therefore, propose a new name, *Entaliopsis*. The fossil species here included differ slightly from the type, inasmuch as they exhibit longitudinal striæ, which become more or less effaced on approaching the anterior portion of the test. The fissure is identical with that of *D. entalis*, and we do not consider the possession of the striæ of generic importance.

Entaliopsis anceps, J. de C. Sowerby.

Dentalium anceps, J. de C. Sby.—Trans. Geol. Soc. 1837, ser. ii. vol. v. p. 136, pl. viii. fig. 17.

Fustiaria anceps, R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 284.

"Slightly arched, longitudinally ribbed towards the apex; one rib on each side of the arch prominent and sharp; smooth towards the aperture, which is round."—*J. de C. Sowerby.* This species is short and of relatively large diameter; fissure rudimentary and not often preserved in specimens; longitudinal ribbing strongly marked; closely set concentric striæ clearly developed, especially on the posterior

region. The anterior extremity of the test is considerably dilated, and is a striking feature in the species. The type specimen in the National Collection is imperfect, and the characters above given have been drawn up from the examination of a number of individuals.

Formation.—London Clay. *Localities.*—Chalk Farm, Finchley, Hampstead, Haverstock Hill, Hornsey, and Whetstone.

Entaliopsis brevis, Deshayes.

Dentalium breve, Desh.—Desc. Anim. sans Vert. 1861, vol. ii. p. 201, pl. i. figs. 7, 8.

Dentalium (*Entalis*) *brevis*, Cossm.—Ann. Soc. R. Mal. Belgique, 1888, vol. xxiii. p. 9.

Fustiaria brevis, R. B. Newton. — Syst. List Edwards Coll. British Museum, 1891, p. 284.

The specimens in the Natural History Museum Collection are not very well preserved, but agree with M. Deshayes' description and figure. From the examination of a perfect specimen M. Cossmann is able to state that it is ornamented by obsolete ribs, and is furnished posteriorly with a short fissure. Rather rare.

Formation.—Thanet Sands. *Locality.*—Herne Bay.

Entaliopsis annulata, n.sp. Pl. VI. Fig. 1.

Shell slightly arched, tapering gradually; section circular; surface ornamented with numerous closely set annulations; longitudinal striæ more or less obsolete; fissure short and broad.

Dimensions.—Length 12; diam. 2·5 mm.

This species differs from others included in this genus by the possession of delicate annulations. Annulations are more characteristic of *Fustiaria*, but the great length of the fissure in the latter prevents any misconception arising as to the generic determination of our species. Its fine annulations are somewhat analogous in structure to those of *Fustiaria subeburnea*, but are much more closely set. The type specimen is in the best state of preservation, although not the largest of the species; an imperfect example from Primrose Hill has a diameter of 3 mm., and exhibits the surface ornamentation, both longitudinal and transverse, more than usually distinct. Rare; five specimens in the National Collection.

Formation.—London Clay. *Localities.*—Portsmouth (type), Southampton, and Primrose Hill.

Entaliopsis grandis, Deshayes.

Dentalium grande, Desh.—Mém. Soc. Hist. Nat. Paris, 1826, vol. ii. part 2, p. 365, pl. xvii, figs. 1–3. Desc. Anim. sans Vert. 1861, vol. ii. p. 205, pl. ii. figs. 1–4.

Dentalium (*Entalis*) *grande*, Cossm.—Ann. Soc. R. Mal. Belgique, 1888, vol. xxiii. p. 8.

Fustiaria grandis, R. B. Newton. — Syst. List Edwards Coll. British Museum, 1891, p. 285.

Characterized by its large size and comparatively fine longitudinal

ribs. The fissure exhibits the undulations so distinctive of this species, and well described by Deshayes. Rather rare.

Formation.—Bracklesham Beds. *Locality.*—Huntingbridge.

Entaliopsis Parisiensis, Orbigny.

Dentalium semistriatum, Desh.—Mém. Soc. Hist. Nat. Paris, 1826, vol. ii. part 2, p. 367, pl. xvii. figs. 15, 16; *non* Turton, 1819.

Dentalium acuticostum, var., J. de C. Sby.—Dixon's "Sussex," 1850, p. 96, pl. vii. figs. 1, 3a.

Dentalium Parisiense, Orb.—Prod. Pal. Strat. 1850, vol. ii. p. 372. Desh.—Desc. Anim. sans Vert. 1861, vol. ii. p. 210, pl. ii. figs. 17–19.

Dentalium (*Entalis*) *Parisiense*, Cossm.—Ann. Soc. R. Mal. Belgique, 1888, vol. xxiii. p. 9.

Fustiaria Parisiensis, R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 286.

Somewhat like *E. substriata*, but shorter in length, and considerably more arched at its posterior extremity. The longitudinal striæ, though not very conspicuous, correspond in their general characters with those of *E. striata* and *E. substriata*. Rather rare.

Formation.—Bracklesham Beds. *Locality.*—Bracklesham Bay.

Entaliopsis striata, J. Sowerby.

Dentalium striatum, J. Sby.—Mineral Conchology, 1814, vol. i. pl. lxx. fig. 4.

Dentalium costatum, J. de C. Sby.—Dixon's "Sussex," 1850, p. 96, pl. vii. fig. 2; *non* J. Sowerby, 1814.

Dentalium striatum, Desh.—Desc. Anim. sans Vert. 1861, vol. ii. p. 206, pl. i. figs. 9–11.

Dentalium angustum, Desh.—Desc. Anim. sans Vert. 1861, vol. ii. p. 210, pl. i. figs. 1–3.

Dentalium (*Entalis*) *striatum*, Cossm.—Ann. Soc. R. Mal. Belgique, 1888, vol. xxiii. p. 8.

Fustiaria striata, R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 286.

"Surface marked with ten or eleven longitudinal acute, prominent striæ, and several obsolete intervening ones; lines of growth fine, numerous; aperture circular."—*J. Sowerby.* The prominent longitudinal striæ are always more pronounced towards the posterior extremity, and frequently become obsolete or are altogether absent anteriorly. Sowerby's types in the National Collection do not exhibit the fissure on account of their bad state of preservation; but its presence is manifest in several of the Museum specimens, in which it is seen to be very short and broad. Common.

Formations and Localities.—Barton Beds: Barton and Hordwell. Bracklesham Beds: Bracklesham Bay, Brook, and Huntingbridge.

Entaliopsis substriata, Deshayes.

Dentalium acuticostum, var., J. de C. Sby.—Dixon's "Sussex," 1850, p. 96, pl. vii. fig. 16.

Dentalium substriatum, Desh.—Desc. Anim. sans Vert. 1861, vol. ii. p. 208, pl. ii. figs. 5–7.

Dentalium (*Entalis*) *substriatum*, Cossm.—Ann. Soc. R. Mal. Belgique, 1888, vol. xxiii. p. 8.

Fustiaria substriata, R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 286.

Fissure rather longer than in *E. striata*; longitudinal ribbings not so prominent, but otherwise very similar; shell generally less slender, and not so symmetrical in contour; anterior portion much swollen. The last-mentioned character is very noticeable in specimens from Bramshaw. *E. substriata* approximates rather closely to *E. Brongniarti*, Desh., of the Paris basin. J. de C. Sowerby's type of *D. acuticostum*, var., is in the Natural History Museum. Common.

Formations and Localities.—Barton Beds: Barton. Bracklesham Beds: Bracklesham Bay, Bramshaw, Brook, and Huntingbridge.